

**Serial No. 09/914,701**

**Art Unit: 1742**

other than zinc, and  $n$  chemically distinct species of anions other than anions derivable by ionization of phosphoric and nitric acids, each of  $m$  and  $n$  independently being zero or a positive integer, the concentration of zinc in moles per liter in said liquid composition satisfying the following mathematical condition:

$$\{Zn\} \leq 0.3 \{H_3PO_4\} + 0.5 \{HNO_3\} - 0.5 \sum_{i=0}^m p_i C_i + 0.5 \sum_{j=0}^n q_j A_j$$

in which: " $\{Zn\}$ ", " $\{H_3PO_4\}$ ", and " $\{HNO_3\}$ " respectively represent the zinc, phosphoric acid, and nitric acid concentrations in mol/L; each of  $C_0$  and  $A_0$  is zero; each of  $p_0$  and  $q_0$  is 1; if  $m$  is not zero, for each positive integer  $i$  from 1 to  $m$ ,  $C_i$  represents the concentration in mol/L of the  $i$ 'th distinct cation species other than zinc present in the bath and  $p_i$  represents the cationic valence of said  $i$ 'th distinct cation species; and if  $n$  is not zero, for each positive integer  $j$  from 1 to  $n$ ,  $A_j$  represents the concentration in mol/L of the  $j$ 'th distinct anion species other than anions derivable by ionization of phosphoric or nitric acids present in the bath and  $q_j$  represents the anionic valence of said  $j$ 'th distinct anion species;

- the phosphoric acid concentration is from 0.25 to 0.50 mol/L;
- the nitric acid concentration is from 0.65 to 0.90 mol/L; and

$$\{Zn\} \geq 0.27 \{H_3PO_4\} + 0.45 \{HNO_3\} - 0.45 \sum_{i=0}^m p_i C_i + 0.45 \sum_{j=0}^n q_j A_j$$

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12. (Amended) A liquid composition that is suitable as electrolyte for a non-sludging electrolytic zinc phosphate treatment process, said liquid composition comprising water, at least 0.10 mol/L dissolved phosphoric acid, at least 0.3 mol/L dissolved nitric acid, dissolved zinc cations,  $m$  chemically distinct species of cations other than zinc, and  $n$  chemically distinct species of anions other than anions derivable by ionization of phosphoric and nitric acids, each of  $m$  and  $n$  independently being zero or a positive integer, the concentration of zinc in moles per liter in said liquid composition satisfying both of the following mathematical conditions:

$$\{Zn\} \leq 0.3 \{H_3PO_4\} + 0.5 \{HNO_3\} - 0.5 \sum_{i=0}^m p_i C_i + 0.5 \sum_{j=0}^n q_j A_j; \text{ and}$$

$$\{Zn\} \geq 0.15 \{H_3PO_4\} + 0.25 \{HNO_3\} - 0.25 \sum_{i=0}^m p_i C_i + 0.25 \sum_{j=0}^n q_j A_j$$

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